

PATENT SPECIFICATION

DRAWINGS ATTACHED

874 743



Index at acceptance
International Class

ERRATUM

SPECIFICATION No. 874,743

Page 1, line 65, *after* "re-" insert "ciproca-
tion lengthwise of the direction of"

THE PATENT OFFICE
4th January 1965

Improv

We, THE ME
a Company Inc
Great Britain, do hereby declare the invention,
5 for which we pray that a patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statement:—
This invention relates to the curing of ink
10 applied to plastic bottles.
The curing of ink freshly applied to plastic bottles is usually effected in large ovens and

plastic bottles decorated with a heat-curable ink, bottle-engaging means operable in timed relation with the conveyor means to engage a bottle conveyed thereby and to effect rotation of the bottle about the axis thereof, and heater means operable in timed relation with the bottle-engaging means to direct a jet of heating medium on the decorated surface of the bottle during rotation of the bottle by the

PATENT ACT, 1949

SPECIFICATION NO. 874.743

In accordance with the Decision of the Superintending Examiner. acting for the Comptroller-General, dated the ninth day of January, 1962 this Specification has been amended under Section 29 in the following manner:—

Page 4, line 5, *after* "direction" insert "at right angles to the direction"

THE PATENT OFFICE,
19th February, 1962

DS 61230/1(6)/3537 200 2/62 PL

ping rotation of the bottle causing a jet of heating medium to be directed on the heat-curable ink decorated surface of the bottle to effect curing of the ink.
35 Further according to the invention there is provided apparatus for curing heat-curable ink decoration applied to plastic bottles, said apparatus including means to support and effect rotation of a bottle about the axis thereof, and heater means to direct a jet of heating medium on to the decorated surface of the bottle during rotation thereof.
40 Still further according to the invention there is provided apparatus for curing heat-
[Price 3s. 6d.]

able with the heater carriage and arranged to raise a bottle from a carriage and to support it for rotation about the axis thereof for heating by the heating medium, and bottle-rotating means co-operating with the bottle raising means and operable to effect rotation of the bottle during the application of heating medium to the bottle.

In order that the invention may be clearly understood one embodiment thereof will now be described, by way of example, with reference to the accompanying drawings in which:—

Fig. 1 is a sectional elevation, on line I—I,

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PATENT SPECIFICATION

DRAWINGS ATTACHED

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874743



Date of filing Complete Specification: Feb. 8, 1960.

Application Date: March 18, 1959.

No. 9437/59.

Complete Specification Published: Aug. 10, 1961.

Index at acceptance:—Classes 34(2), G1(K: M1: Q2: Q4), G3A3A; and 100(2), C28L.

International Classification:—F26b. B41f.

COMPLETE SPECIFICATION

Improvements in or relating to Curing Ink Applied to Plastic Bottles

We, THE METAL BOX COMPANY LIMITED, a Company Incorporated under the laws of Great Britain, of 37, Baker Street, London, W.1, England, do hereby declare the invention, for which we pray that a patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to the curing of ink applied to plastic bottles.

The curing of ink freshly applied to plastic bottles is usually effected in large ovens and it is an object of the present invention to avoid the use of ovens for this purpose and to effect curing by a method which provides the bottles with a finish which is shiny as compared with that of bottles subjected to curing in an oven.

According to the invention there is provided the method of curing heat-curable ink decoration applied to a plastic bottle by directing a jet of heating medium on to the heat curable ink decorated surface of the bottle during rotation of the bottle about the axis thereof.

Further according to the invention there is provided the method of curing heat-curable ink decoration applied to a plastic bottle by rotating the bottle about the axis thereof for a predetermined interval during movement thereof along a predetermined path for a predetermined interval between starting and stopping rotation of the bottle causing a jet of heating medium to be directed on the heat-curable ink decorated surface of the bottle to effect curing of the ink.

Further according to the invention there is provided apparatus for curing heat-curable ink decoration applied to plastic bottles, said apparatus including means to support and effect rotation of a bottle about the axis thereof, and heater means to direct a jet of heating medium on to the decorated surface of the bottle during rotation thereof.

Still further according to the invention there is provided apparatus for curing heat-curable ink decoration applied to plastic bottles, comprising conveyor means operable to move in a predetermined path a succession of plastic bottles decorated with a heat-curable ink, bottle-engaging means operable in timed relation with the conveyor means to engage a bottle conveyed thereby and to effect rotation of the bottle about the axis thereof, and heater means operable in timed relation with the bottle-engaging means to direct a jet of heating medium on the decorated surface of the bottle during rotation of the bottle by the bottle-engaging means.

Still further according to the invention there is provided apparatus for curing heat-curable ink decoration applied to plastic bottles, said apparatus including a succession of carriages movable with an endless conveyor and arranged each to support a bottle having heat-curable ink freshly applied to an outer surface thereof, a heater carriage supported for removal of the conveyor, actuating means operable in timed relation with the conveyor to effect reciprocation of the heater carriage and to effect movement thereof in the direction of movement of the conveyor at the linear speed of the conveyor, heater means movable with the heater carriage and operable to direct a jet of heating medium on to the ink-bearing surface of a bottle, bottle-engaging means movable with the heater carriage and arranged to raise a bottle from a carriage and to support it for rotation about the axis thereof for heating by the heating medium, and bottle-rotating means co-operating with the bottle raising means and operable to effect rotation of the bottle during the application of heating medium to the bottle.

In order that the invention may be clearly understood one embodiment thereof will now be described, by way of example, with reference to the accompanying drawings in which:—

Fig. 1 is a sectional elevation, on line I—I,

Fig. 2, of apparatus according to the invention,

Fig. 2 is a top plan of Fig. 1, some parts being omitted,

5 Fig. 3 is a section on line III—III, Fig. 2, and

Fig. 4 is a section on line IV—IV, Fig. 3.

10 In the following description it is to be understood that the bottles are made of plastic material, for example of polyethylene, in any suitable manner, for example by enclosing a length of extruded tube in a mould and blowing the tube to the shape of the interior of the closed mould.

15 The bottles have lettering or decorative matter applied to the sides thereof, in known manner, by the use of ink which, after application to the bottle, is cured by heat.

20 Referring to the drawings, bottles B to which ink has been freshly applied are delivered from the ink applicator, not shown, one at a time to carriages 1 mounted on an endless conveyor 2 driven continuously from a main shaft, not shown.

25 A heater carriage 3 is supported by guide rods 4 which extend lengthwise of the upper run of the conveyor and the heater carriage is reciprocable along the rods 4. The rods 4 are supported by brackets 5 secured to the side frames 6, Fig. 2 for the apparatus. The heater carriage is connected by pivoted links 7, 8 and a roller 9 with a box cam 10 mounted on a cross shaft 11 provided with a sprocket wheel 12, Fig. 2, by which the shaft 35 is connected with the main shaft, not shown, to be rotatable in timed relation with the conveyor 2. The cam 10 controls reciprocation of the heater carriage.

40 Three gas burners 13 are supported by the heater carriage and are arranged so that they each extend lengthwise at right angles to the direction of movement of the upper run of conveyor 2 so that the flames emitted therefrom extend lengthwise of the longitudinal axes of bottles located beneath the burners and are radial to said axes. The burners 13 are connected by flexible tubes 14 with a valve 15 operable by a cam 16 rotatable with cross shaft 11 to control the supply of a gas mixture 50 to the burners.

Also mounted on the heater carriage is a bottle pick-up and rotating device comprising three frusto-conical spigots 17, Figs. 2 and 3, freely rotatable in a spigot support 18 carried by a reciprocable spindle 19 the operation 55 of which is controlled by a cam-operated toggle mechanism. The toggle mechanism comprises toggle arms 20, Figs. 3 and 4, pivotally secured to arms 21 mounted on the heater carriage and to a collar 22 secured to the spindle 19. Springs 23 are arranged to retain the toggle arms 20 in one or other of two positions thereof to which they are moved by co-operation of an operating roller 24 carried by spindle 19 with cams 25, 26, Fig. 2, 65

mounted on one of the frames 6.

Axially aligned with each of the spigots 17 is a bottle bottom-engaging pad 27. Each pad 27 is supported for rotation with a spindle 28, Fig. 3, and these spindles have sprocket wheels 29 secured thereto and connected with each other by a chain 30 which also passes round a driving sprocket wheel 31 secured to the shaft 32 of a variable speed gear 33 driven by an electric motor 34 supported by the heater carriage for movement therewith. The face of each pad 27 which faces the spigot 17 appropriated thereto is contoured as at 35, Fig. 3, to permit the bottom of a bottle to be nested therein for rotation by the pad.

The operation of the apparatus is as follows:—Where three bottles carried in three successive carriages 1 are disposed in axial alignment with the spigots 17 the heater carriage is in the datum or starting position thereof and movement thereof, to the right as viewed in Fig. 1, is initiated by cam 10, the heater carriage being caused to move with a linear speed equal to that of conveyor 2. The toggle-operating roller 24 engages cam 25 and moves spindle 19, to the right as viewed in Fig. 3, so that the spigots 17 enter the mouths of the bottles aligned therewith simultaneously to raise the bottles from the carriages 1, by about 1/16 inch, and to press the bottoms of the bottles against the contoured portions 35 of the pads 27 so that the bottles are rotated about their axes by the pads. At about the same time the cam 16 operates valve 15 so that jets of flame from the burners 13 are directed substantially radially of the axes of the bottles and on to the rotating bottles to effect curing of the ink. As the heater carriage approaches the end of its forward stroke the toggle-operating roller engages cam 26 and effects withdrawal of the spigots 17 from the mouths of the bottles so that the bottles are returned to the carriages 1 from which they were initially raised, and the cam 16 causes the gas flames to be cut-off or reduced. The heater carriage is then returned quickly with a constant acceleration to the datum position thereof in preparation for a further ink curing cycle.

In the foregoing description the heating medium has been described as being a gas flame, if desired however, the heating medium may be hot air directed on to the rotating bottles by air-ejecting nozzles controlled by a suitable valve in a manner similar to that described above.

It will be understood that the surface of the bottles and the ink thereon will attain a relatively high temperature but softening and deformation of the bottles is avoided due to the fact that the heat conductivity of plastics is low and by arranging that the period of exposure of the bottles to the flames is short. It will also be understood that for different plas-

tic materials and inks the interval for curing will differ.

If desired, to reduce the tendency for softening of bottles during ink curing the carriages 1 may move the bottles carried thereby in succession to and past two or more heater carriages each as described above, the spacing between the successive heater carriages being such as to allow a cooling of bottles during movement thereof from one heating station to the next. Further, if desired, the spacing between heating stations may be reduced by applying a cooling medium to the bottles and this may be effected by arranging that at each heating station there is provided a cooling device arranged to apply a cooling medium to the bottles during the application thereto of the heating medium. The cooling device would be disposed at the heating station but at a position opposite to the heating device so that a bottle between the heating and cooling devices during treatment of the bottle.

The cooling device may comprise a plurality of cool air injection nozzles arranged in a line parallel with the axis of rotation of a bottle.

It is to be understood that the heating carriage may be provided with draught excluding means arranged to ensure that draughts do not tend to cause the heating medium to be deflected and that such medium is directed on to an area of predetermined extent.

It is further to be understood that the axes of rotation of bottles may be either vertical or horizontal.

WHAT WE CLAIM IS:—

1. The method of curing heat-curable ink decoration applied to a plastic bottle by directing a jet of heating medium on to the heat-curable ink decorated surface of the bottle during rotation of the bottle about the axis thereof.

2. The method of curing heat-curable ink decoration applied to a plastic bottle by rotating the bottle about the axis thereof for a predetermined interval during movement thereof along a predetermined path and for a predetermined interval between starting and stopping rotation of the bottle causing a jet of heating medium to be directed on to the heat-curable ink decorated surface of the bottle to effect curing of the ink.

3. The method according to Claim 1 or Claim 2, wherein the jet of heating medium is directed towards the bottle in a direction which is substantially radial with respect to the axis of rotation of the bottle.

4. The method according to Claim 1 or Claim 2, or Claim 3, wherein the heating medium is applied to the bottle at each of two or more successive stations.

5. The method according to any one of Claims 1 to 4, wherein the jet of heating medium is a gas flame.

6. Apparatus for curing heat-curable ink

decoration applied to plastic bottles, said apparatus including means to support and effect rotation of a bottle about the axis thereof, and heater means to direct a jet of heating medium on to the decorated surface of the bottle during rotation thereof.

7. Apparatus for curing heat-curable ink decoration applied to plastic bottles, comprising conveyor means operable to move in a predetermined path a succession of plastic bottles decorated with a heat-curable ink, bottle-engaging means operable in timed relation with the conveyor means to engage a bottle conveyed thereby and to effect rotation of the bottle about the axis thereof, and heater means operable in timed relation with the bottle-engaging means to direct a jet of heating medium on to the decorated surface of the bottle during rotation of the bottle by the bottle-engaging means.

8. Apparatus for curing heat-curable ink decoration applied to plastic bottles, said apparatus including a succession of carriages movable with an endless conveyor and arranged each to support a bottle having heat-curable ink freshly applied to an outer surface thereof, a heater carriage supported for reciprocation lengthwise of the direction of movement of the conveyor, actuating means operable in timed relation with the conveyor to effect reciprocation of the heater carriage and to effect movement thereof in the direction of movement of the conveyor at the linear speed of the conveyor, heater means movable with the heater carriage and operable to direct a jet of heating medium on to the ink-bearing surface of a bottle, bottle-engaging means movable with the heater carriage and arranged to raise a bottle from a carriage and to support it for rotation about the axis thereof for heating by the heating medium, and bottle-rotating means co-operating with the bottle-raising means and operable to effect rotation of the bottle during the application of heating medium to the bottle.

9. Apparatus according to Claim 8, including a valve connected with the heater means and operable in timed relation with the movements of the heater carriage to control the duration of the application of heating medium to the bottle.

10. Apparatus according to Claim 8 or Claim 9, wherein the bottle-raising means comprises a rotatable cam-controlled toggle-operated frusto-conical spigot, and the bottle rotating means comprises a rotatable pad axially aligned with the spigot and movable with the heater carriage, said spigot being supported by the heater carriage for axial movement towards and away from said pad in a manner such that the spigot co-operates with an end portion of a bottle to raise it from a carriage and to press the bottle against the pad for rotation thereby.

11. Apparatus according to any one of

Claims 6 to 10, wherein the heater means comprises a gas burner.

12. Apparatus according to Claim 11, wherein the gas burner extends lengthwise in a direction of movement of said carriages.

13. Apparatus according to any one of Claims 8 to 10, or to Claim 12, including a plurality of bottle-rotating means, bottle raising means co-operating with each of the bottle-rotating means and operable to effect the simultaneous raising of bottles engageable thereby, and heater means appropriated to each of the bottle-rotating means.

14. Apparatus according to Claim 13, wherein the bottle raising means are mounted on a support common thereto to permit a plurality of bottles to be raised simultaneously and moved into co-operation with the bottle-

rotating means appropriate thereto.

15. The method of curing heat-curable ink decoration applied to plastic bottles substantially as herein described.

16. Apparatus for curing heat-curable ink decoration applied to plastic bottles substantially as herein described with reference to and as illustrated in the accompanying drawings.

17. A plastic bottle having a heat-curable ink decoration applied thereto and cured according to any one of Claims 1 to 5 or 15, or cured by apparatus according to any one of Claims 6 to 14 or 16.

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PROVISIONAL SPECIFICATION

Improvements in or relating to Curing Ink Applied to Plastic Bottles

We, THE METAL BOX COMPANY LIMITED, a Company incorporated under the laws of Great Britain, of 37, Baker Street, London, W.1, England, do hereby declare this invention to be described in the following statement:—

This invention relates to the curing of ink applied to hollow plastic articles such as bottles.

The curing of ink freshly applied to hollow plastic articles such as bottles is usually effected in large ovens and it is an object of the present invention to avoid the use of ovens for this purpose and to effect curing by a method which provides the articles with a finish which is shiny as compared with that of articles subjected to curing in an oven.

According to the invention there is provided the method of curing ink applied to hollow plastic articles such as bottles which includes directing a heating medium on to an outer surface of an article to which ink is freshly applied and simultaneously effecting rotation of the article.

The heating medium may be directed towards the article in a direction which is substantially radial with respect to the axis of rotation of the article. A heating medium may be applied to the article at two or more stations between which the article is moved to permit cooling thereof between successive applications of the heating medium, thereto.

The method may include the application of a cooling medium to the article during the application of the heating medium thereto. The cooling medium may be applied to the article surface to which the ink is applied, the application of the cooling medium to the article being effected at a position remote from that at which the heating medium is applied to the article. Said remote position may be diametrically opposite to that at which the heating

medium is applied to the article.

If desired, the cooling medium may be applied to the interior of the article.

Further according to the invention there is provided apparatus for curing ink applied to hollow plastic articles such as bottles, said apparatus including means to support and effect rotation of an article having ink freshly applied to an outer surface thereof, and means to direct a heating medium on to said surface during rotation of the article.

The article supporting and rotating means may be carried by a conveyor adapted to move the article in one direction to two or more stations at each of which means is provided to direct a heating medium on to said surface during rotation of the article.

The means for directing a heating medium on to the article may be adapted to direct the heating medium towards the article in a direction which is substantially radial with respect to the axis of rotation of the article by the article supporting and rotating means. The means for directing a heating medium on to the article may comprise a plurality of gas-burners or hot air ejecting nozzles arranged in a line parallel with the axis of rotation of the article.

The apparatus may include means to apply a cooling medium to an article during the application of the heating medium thereto. Said means may be disposed at a position remote from that at which the means for applying the heating medium is located, and such positions may be diametrically opposite each other.

The means for applying cooling medium may comprise a plurality of cool air ejecting nozzles arranged in a line parallel with the axis of rotation of the article. Alternatively, the means for applying cooling medium may comprise a cool air ejecting nozzle adapted to apply cool

air to the interior of the article.

In order that the invention may be clearly understood some embodiments thereof will now be described by way of example.

- 5 In the following examples, the articles will be referred to as bottles, and it is to be understood that the bottles are made of plastic material, in any suitable manner, for example by enclosing a length of extruded tube in a mould and blowing the tube to the shape of the interior of the closed mould.

- 10 The bottles have lettering or decorative matter applied to the sides thereof, in known manner, by the use of an ink which, after application to the bottle, is cured by heat.

- 15 In accordance with the invention a bottle having ink freshly applied to the exterior thereof is mounted on a support which is coupled to driving mechanism arranged to rotate the bottle about the longitudinal axis thereof. During rotation thereof the bottle is positioned before a device which is to direct a heating medium on to the surface of the bottle thereby to effect heating thereof and curing of the ink applied thereto. In one embodiment of the invention said device comprises a plurality of gas burners arranged in a line parallel with the axis of rotation of the bottle. It will be understood that the surface of the bottle and the ink thereon will attain a relatively high temperature but softening and deformation of the bottle is avoided due to the fact that the heat conductivity of plastics is low and by arranging that the period of exposure of the bottle to the flame is short. It will also be understood that for different plastics materials and inks the interval for curing will differ. It is preferred that curing be effected by a flame as just described because when so treated the bottles have a shiny finish which is not obtained when curing is effected in an oven.

- 45 In one embodiment of the invention a plurality of rotatable bottle supports are mounted on a conveyor arranged to move bottles in

turn, in one direction, to and past the device for applying the heating medium to the bottles, and the conveyor may comprise an endless conveyor, a rotatable table, or a rotatable wheel by which the bottles are supported during the application of the ink thereto.

To reduce the tendency for softening of bottles during ink curing the conveyor may move each bottle in succession to and past two or more devices for applying the heating medium, the spacing between the successive devices being such as to allow a cooling of a bottle during movement thereof from one device to the next. This spacing may be reduced by applying a cooling medium to the bottles and this may be effected by arranging that at each heating position there is provided a cooling device arranged to apply a cooling medium to the bottle during the application thereto of the heating medium. The cooling device is disposed at a position remote from that at which the heating device is located and is preferably diametrically opposite the heating device.

The cooling device may comprise a plurality of cool air injecting nozzles arranged in a line parallel with the axis of rotation of the bottle.

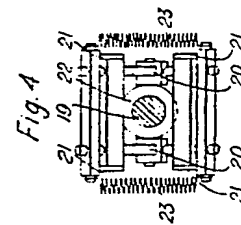
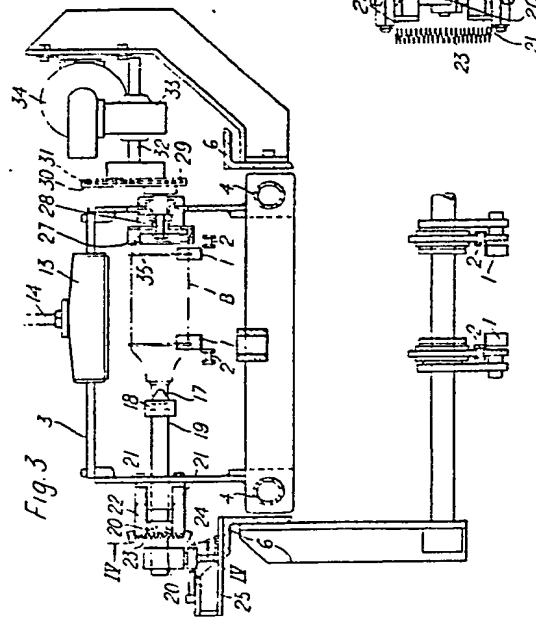
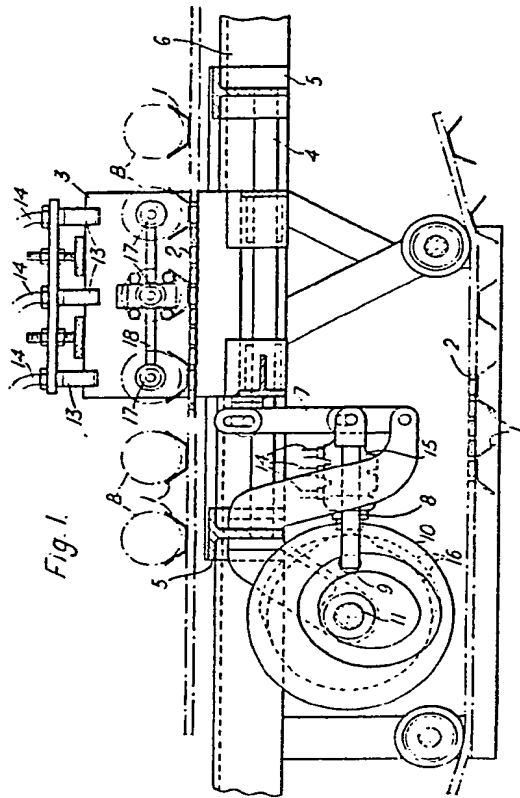
In an alternative arrangement each rotatable bottle support may have a cool air injecting nozzle associated therewith and arranged to blow cool air into the interior of the bottle during heating thereof.

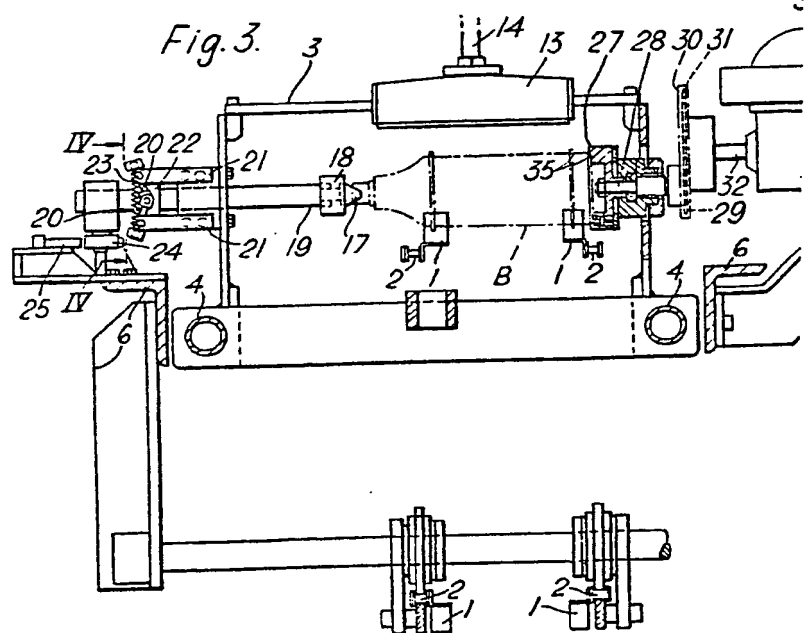
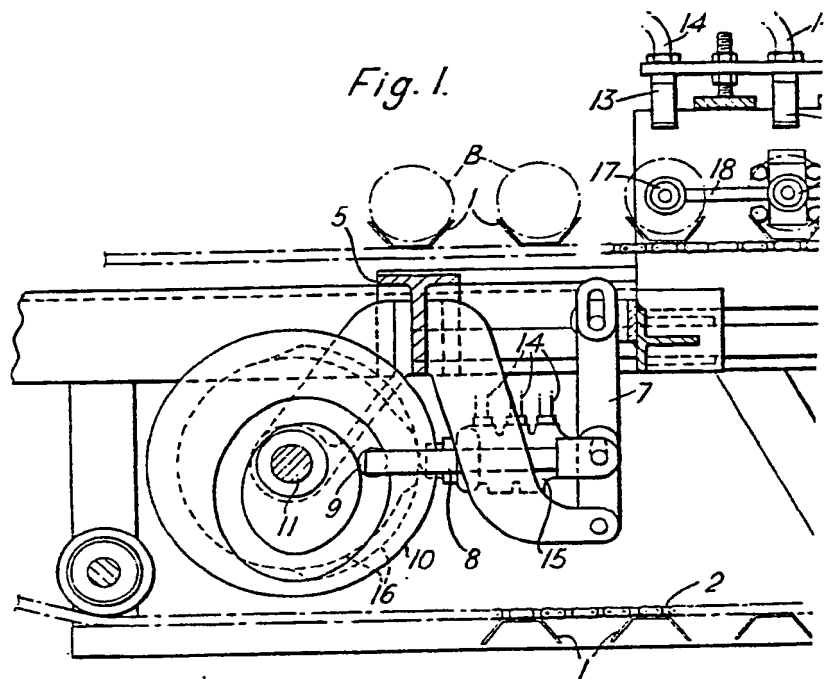
It is to be understood that the heating device may be provided with draught excluding means arranged to ensure that draughts do not tend to cause the heating medium to be deflected and that such medium is directed on to an oven of predetermined extent.

It is further to be understood that the axis of rotation of the bottles may be either vertical or horizontal.

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Leamington Spa: Printed for Her Majesty's Stationery Office, by the Courier Press.—1961.
Published by The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies may be obtained.





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COMPLETE SPECIFICATION

2 SHEETS

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Sheet 1

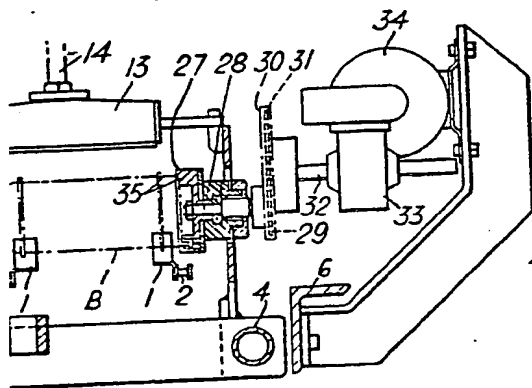
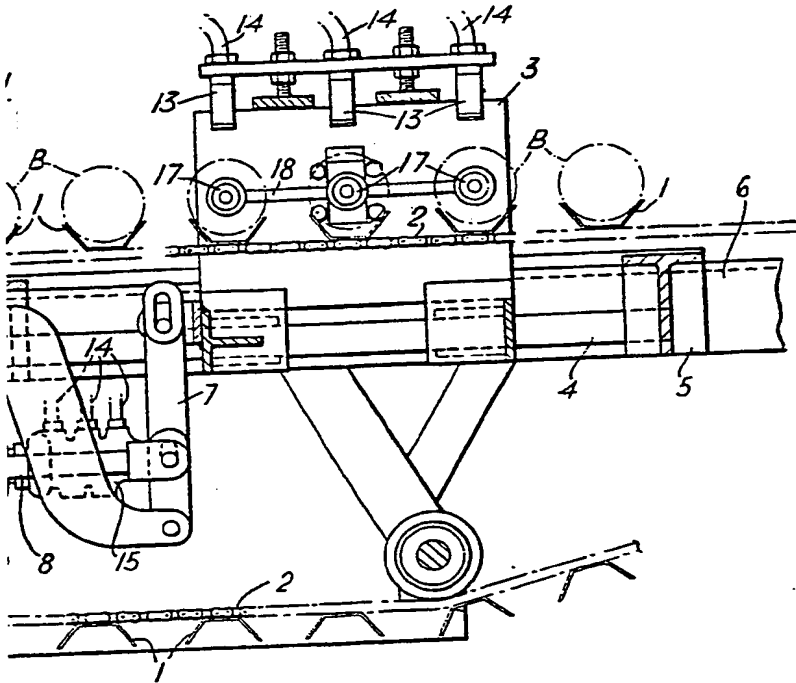


Fig. 4.

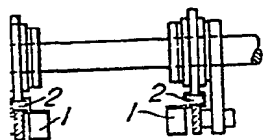
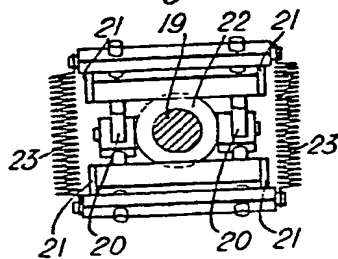
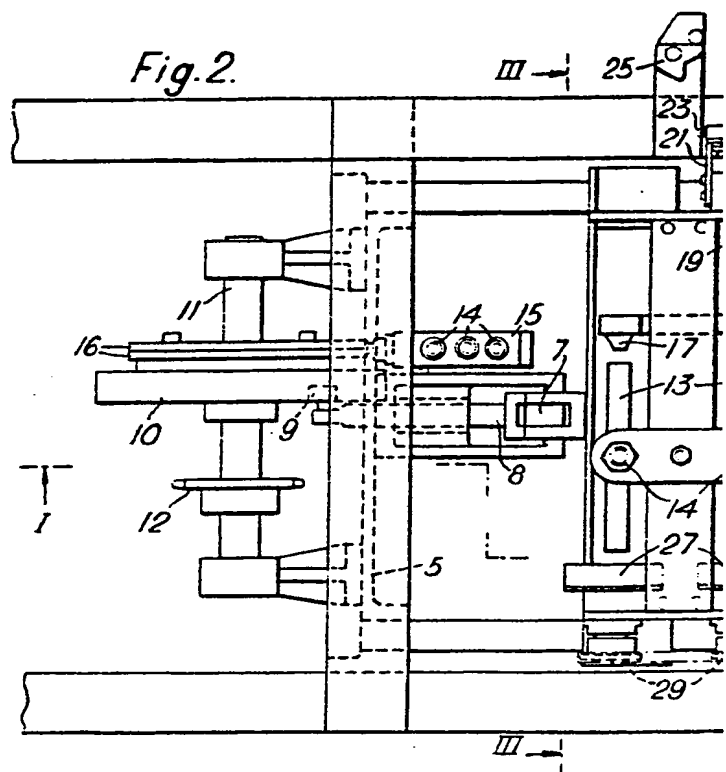


Fig. 2.



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COMPLETE SPECIFICATION

2 SHEETS

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Sheet 2

